Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Coosa River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Rome, Ga	225	30	5.9	8,9	2.6	5,6	3.7	3.3
Gadsden, Ala	144	18	6.5	10,11	2.7	1,2	4.5	3.8
Tombigbee River.								
Columbus, Miss.	285	33	21.8	11	0.1	2	8.8	21.7
Demopolis, Ala	155	35	47.6	17	3.9	2	31.5	43.7
Black Warrior River.								
Tuscaloosa, Ala	90	38	49.3	8	4.4	1	20.8	44.9
Pedee River.								
Cheraw, S. C.	145	27	27.8	9	2.0	2	9.2	25.8
Black River.								
Kingstree, S. C	60	12	9.9	24,25	6.9	13,14	8.4	3.0
Lumber River.								
Fairbluff, N. C.	10	6	5.7	22	3.2	11	4.5	2.5
Lynch Creek.								
Effingham, S. C.	35	12	12.4	22	4.3	11	8.1	8.1
Potomac River.								
Harpers Ferry, W. Va.	170	16	6.8	7	3.0	31	4.7	3.8
Roanoke River.								
Clarksville, Va.	155	12	13.7	9	1.5	31	3.8	12.2
Sacramento River.								
Red Bluff, Cal.	241	23	13.5	16	0.4	1,5	4.6	13.1
Sacramento, Cal.	70	25	16.6	22	8.2	1	13.2	8.4

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Santee River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Stephens, S. C.	50	12	9.3	21-23	6.4	9	8.0	2.9
Congaree River.								
Columbia, S. C.	37	15	8.5	8	0.6	1,6	2.6	7.9
Wateree River.								
Camden, S. C.	45	24	23.8	8	5.5	2	10.8	18.3
Savannah River.								
Augusta, Ga.	130	32	22.9	8	8.5	6	12.7	14.4
Susquehanna River.								
Wilkesbarre, Pa.	178	14	21.0	7	4.5	1,2	11.7	16.5
Harrisburg, Pa.	70	17	8.0	7	2.9	3	4.4	5.1
Juniata River.								
Huntingdon, Pa.	80	24	5.5	25	4.0	1-4	4.7	1.5
W. Br. of Susquehanna.								
Williamsport, Pa.	35	20	8.0	7	3.0	31	4.5	5.0
Waccamaw River.								
Conway, S. C.	40	7	5.3	31	2.3	10	3.6	3.0

• Distance to Gulf of Mexico. † Record for 25 days. ‡ Record for 26 days.
§ Record for 27 days. ‖ Record for 30 days. ¶ Record for 23 days.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Chief of Division of Records and Meteorological Data.

General remarks.—The weather of January, 1899, was fairly typical of midwinter conditions. The atmospheric circulation was vigorous, and the alternations from fair to stormy weather were sharp and more decided than during the preceding month.

The distinguishing characteristics of the month were perhaps the distribution and frequency of highs and lows, as shown in detail in the preceding section, and the sharp fall in mean pressure over the Rocky Mountain and Plateau regions.

From the 26th to the end of the month there was a succession of cold waves with high winds and snow throughout the Rocky Mountain region and a portion of the plains eastward to the Mississippi Valley. As the month closed a cold wave was moving southward and eastward to the line of zero temperature, extending from northwestern Texas to central Ohio.

While the stormy conditions above mentioned were prevailing in the Rocky Mountain region, midsummer weather was being experienced in California. Temperatures at midday, ranging from 70° to 80°, were observed in the Great Valley and southern California. At San Francisco a maximum temperature of 78° was registered on the 26th, the highest January maximum recorded during the past twenty-seven years.

PRESSURE AND WIND.

The character of the weather on the Pacific coast is largely determined by the pressure distribution, both in that region and farther to the eastward. During the preceding month pressure was unusually high over the Plateau region, and the course of the north Pacific lows was so far to the northeastward that scarcely any rain fell in California where droughty conditions had prevailed since October. Fortunately for the great agricultural and commercial interests of that State, this condition of affairs came to an end on January 1, 1899, when a vigorous north Pacific low caused general rains throughout the State. The snow covering on the mountains, hitherto scanty indeed, was considerably increased, and the outlook of previous weeks was much improved. Other lows approached from the west, and the rains came in generous proportions until the 20th, after which date substantially no rain fell in California and but little elsewhere on the Pacific coast. The weather on the coast during this period was dominated by a succession of highs that apparently moved inland from the Pacific. The lows, on the other hand, to whose influence precipitation on the coast is due, had their origin in Alberta, moving thence southeastward, but at such a distance as to exert no influence upon the weather of the coast.

East of the Rocky Mountains there was the usual alternation from warm and pleasant, to cold and stormy, weather.

The number of lows that originated in Texas and on the Gulf coast was greater than usual, and as a result there was generous rainfall in the Gulf States, Florida, the middle Mississippi Valley, and the Ohio Valley and Tennessee. In the first-named States farm work was much retarded by reason of the excess of rain.

TEMPERATURE OF THE AIR.

The departures of temperature were not very marked in any section. The greatest positive departures were observed throughout an irregular area extending from Kansas City to the headwaters of the Missouri River, thence westerly and southwesterly to include northern Wyoming, Utah, and Nevada, eastern Oregon and Washington, and practically all of Idaho. The negative departures were generally small. No especially severe cold waves occurred. Cold weather and snow were experienced on the Atlantic seaboard on the 1st. The next general period of cold weather fell on the 5th, 6th, and 7th, and zero temperatures were registered in New England and eastern New York on the 8th and 9th. A moderate cold wave moved from the northwest to New England by way of the Lake region on the 17th, 18th, and 19th, and, as stated under "general remarks," a succession of cold waves with snow and zero temperatures moved southward over the Rocky Mountain and Plains regions from the 26th to the close of the month.

The distribution of the observed monthly mean temperature of the air is shown by red lines (isotherms) on Chart VI. This chart also shows the maximum and the minimum temperatures, the former by black and the latter by dotted lines.

As will be noticed, these lines have been drawn over the Rocky Mountain Plateau region, although the temperatures have not been reduced to sea level; the isotherms relate, therefore, to the average surface of the country in the neighborhood of the various observers, and as such must differ greatly from the sea-level isotherms of Chart IV.

The average temperatures of the respective geographic districts, the departures from the normal of the current month and from the general mean since the first of the year, are presented in the table below for convenience of reference:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	27.3	+ 0.5		
Middle Atlantic	12	32.5	0.0		
South Atlantic	10	46.8	+ 0.2		
Florida Peninsula	7	61.6	+ 1.3		
East Gulf	7	49.1	− 0.8		
West Gulf	7	47.2	+ 0.6		
Ohio Valley and Tennessee	12	34.6	+ 0.4		
Lower Lake	8	25.5	+ 0.2		
Upper Lake	9	17.1	− 0.5		
North Dakota	7	5.0	+ 3.8		
Upper Mississippi	11	24.0	+ 2.9		
Missouri Valley	10	25.2	+ 5.0		
Northern Slope	7	21.2	+ 4.2		
Middle Slope	6	31.0	+ 3.0		
Southern Slope	6	37.0	+ 0.6		
Southern Plateau	9	40.0	− 0.4		
Middle Plateau	13	29.6	+ 4.5		
Northern Plateau	10	29.5	+ 4.8		
North Pacific	9	41.0	+ 1.9		
Middle Pacific	5	49.9	+ 2.8		
South Pacific	4	53.9	+ 3.3		

In Canada.—Prof. R. F. Stupart says:

Temperature conditions were in several respects rather remarkable, especially so in the Ottawa Valley and the Lake region, where the change from minus to plus, or vice versa, was very sharply defined. This was very noticeable between Rockliffe and Ottawa, the former place giving 3° below average and the latter 3° above: and again Welland was 3° above and Stratford 2° below average. From British Columbia to Keewatin Territory temperature was everywhere above average, the excess being as much as 6° in northern Alberta. From the eastern portion of Ontario to our Atlantic coast, except in Cape Breton, it was also in all localities above average, but at the majority of places the amount did not exceed 1°.

PRECIPITATION.

Although precipitation was below normal in the majority of districts the minus departures were generally small and without special significance. On the whole, the precipitation was apparently sufficient for all needs.

The numerical values of total precipitation and total depth of snowfall are given in Tables I and II, and the geographic distribution is graphically shown on Charts III and VIII. The depth of snow on the ground is also shown on Chart IX.

In Canada.—Professor Stupart says:

In the Lake Superior district, the Ottawa and St. Lawrence valleys, and also over the greater portion of the Maritime Provinces, precipitation was below average, except very locally, where it was somewhat exceeded. The greatest general deficiency occurred in the Province of Quebec, Quebec itself being 1.7 inch below average, and Father Point 2.0 inches below. In the Northwest Territories and Manitoba it was on the other hand, as a rule, above average, and only very locally below, the greatest amounts above average being 0.9 inch at Winnipeg and Prince Albert, respectively. In British Columbia, Victoria, was 0.7 inch below average, but lower mainland stations report a heavy precipitation. The most noticeable feature of the January precipitation was the phenomenally heavy snowfall in the Georgian Bay region, where at the close of the month the amount of snow reported on the ground was at Parry Sound, 56 inches; Sprucedale, 48 inches; Beatrice, 37 inches; Haliburton, 21 inches; Collingwood, 36 inches; Owen Sound, 27 inches; Bognor, 24 inches. On the other hand in the lower Lake region there was little or no snow on the ground at the end of the month.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	3.85	97	−0.1	
Middle Atlantic	12	3.24	89	−0.4	
South Atlantic	10	4.06	95	−0.2	
Florida Peninsula	7	4.67	163	+1.8	
East Gulf	7	5.36	104	+0.2	
West Gulf	7	4.58	132	+1.1	
Ohio Valley and Tennessee	12	4.30	102	+0.1	
Lower Lake	8	2.37	89	−0.3	
Upper Lake	9	1.23	61	−0.8	
North Dakota	7	0.49	71	−0.2	
Upper Mississippi	11	1.16	66	−0.6	
Missouri Valley	10	0.45	43	−0.6	
Northern Slope	7	0.78	115	+0.1	
Middle Slope	6	0.39	44	−0.5	
Southern Slope	6	0.38	35	−0.7	
Southern Plateau	9	0.65	76	−0.2	
Middle Plateau	13	1.13	79	−0.3	
Northern Plateau	10	2.27	105	+0.1	
North Pacific	9	11.33	136	+3.0	
Middle Pacific	5	6.10	109	+0.5	
South Pacific	4	3.12	115	+0.4	

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 11, 12. Arkansas, 13. California, 2, 4, 10, 11, 17, 18. Louisiana, 3, 14. New Jersey, 24. New York, 24. Oklahoma, 14. Oregon, 1, 2, 3, 11, 13, 14, 31. Texas, 5. Utah, 16. Washington, 11.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 18, 21, 28. Arkansas, 4, 5, 23, 30. California, 1, 3, 9, 10. Colorado, 8, 22, 25, 26. Connecticut, 6, 9, 13, 14, 24. Delaware, 1, 13. District of Columbia, 12. Georgia, 11, 19, 27. Idaho, 3, 6, 7. Illinois, 4, 9, 12, 17, 19, 20, 23, 24, 26, 30. Indiana, 11, 12, 23, 24, 26. Indian Territory, 23. Iowa, 4, 9, 10, 12, 13, 21, 22, 23. Kansas, 11, 23, 25, 28. Kentucky, 3, 5, 6, 10, 11, 12, 17, 20, 22, 23, 24. Louisiana, 3, 4, 8, 9, 10, 13, 14, 15, 27, 28, 30, 31. Maine, 4, 6, 7, 14, 15, 24, 25. Maryland, 5, 6, 7, 12, 13, 15, 31. Massachusetts, 4, 6, 7, 13, 14, 25, 26. Michigan, 4, 5, 10, 12, 13, 14, 23. Minnesota, 11, 12, 19, 22, 23, 25. Mississippi, 6, 24, 25, 27, 30, 31. Missouri, 3, 4, 5, 6, 8, 9, 10, 19, 23, 30. Montana, 12, 15, 16, 17, 18, 24, 25, 28. Nebraska, 10, 11, 25, 26. New Hampshire, 6, 7, 13, 14, 24, 25. New Jersey, 1, 6, 7, 12, 13, 14, 24, 30. New Mexico, 3, 12. New York, 4, 6, 13, 14, 15, 21, 24, 26. North Carolina, 1, 3, 9, 10, 11, 12, 13, 16, 21, 24, 28. North Dakota, 12. Ohio, 6, 12, 14, 24, 26, 31. Oklahoma, 27. Oregon, 2, 5, 6, 7, 9, 10, 13, 15, 21, 31. Pennsylvania, 1, 6, 7, 13, 14, 22, 23, 24. Rhode Island, 7. South Carolina, 11, 12, 18, 19, 23, 28. South Dakota, 12, 20, 22, 23, 25. Tennessee, 3, 6, 18, 24, 30, 31. Texas, 23, 28. Utah, 15, 16. Vermont, 6, 13, 14, 24, 25. Virginia, 1, 6, 11, 12, 13, 30, 31. Washington, 9, 10, 13, 18, 21, 31. West Virginia, 4, 6, 11, 12, 13, 16, 24. Wisconsin, 12, 26. Wyoming, 10, 15, 24, 25, 26.

WIND.

High winds, local storms, and tornadoes.—A rather large number of high winds was reported during the month, as may be seen by an examination of the table below. Many of the high velocities reported in the table, such, for example, as those recorded at Mount Tamalpais and Fort Canby, are due to the fact that the anemometers at those stations are exceptionally well exposed to the full sweep of the winds from every quarter.

7th.—A tornado was reported as having passed over a portion of Liberty County, Georgia, the most damage being done at Johnston, between Savannah and Waycross. No lives lost; other details lacking.

13th.—A tornado was observed about 4 miles northwest of Kilgore, Tex., moving in a northeasterly direction. One tenement house destroyed, and the inmates, six persons, badly injured.

14th.—Very high, and in some cases, destructive storm winds were experienced in Ohio and western Pennsylvania on this date.

23d.—A severe local windstorm visited Greenville, S. C., about 4 p. m. of this date. Roofs were torn off, smokestacks and chimneys demolished, and trees blown down. No fatalities.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	22	52	n.	Fort Canby, Wash.	31	52	se.
Do	23	72	n.	Hatteras, N. C	1	52	nw.
Bismarck, N. Dak	25	52	nw.	Do	16	52	s.
Buffalo, N. Y	4	64	w.	Do	28	58	n.
Do	5	58	sw.	Lexington, Ky	14	55	w.
Do	6	54	w.	Mount Tamalpais, Cal.	1	55	se.
Do	7	71	w.	Do	2	51	w.
Do	14	66	w.	Do	10	86	w.
Do	21	53	w.	Do	24	60	n.
Do	26	72	w.	Do	25	57	ne.
Do	27	60	w.	Do	26	50	ne.
Do	30	54	w.	Do	31	65	nw.
Cairo, Ill	4	54	w.	New York, N. Y	7	54	n.
Carson City, Nev	1	60	sw.	Do	24	52	nw.
Do	31	50	sw.	Do	25	66	nw.
Cheyenne, Wyo	4	60	w.	Do	27	65	n.
Chicago, Ill	26	52	w.	Pierre, S. Dak	22	51	n.
Cleveland, Ohio	14	58	sw.	Do	25	59	nw.
Do	26	50	w.	Point Reyes Light, Cal.	10	75	se.
Denver, Col	22	50	ne.	Do	11	50	se.
El Paso, Tex	30	51	nw.	Do	31	56	nw.
Fort Canby, Wash	1	52	se.	Port Huron, Mich	26	50	sw.
Do	9	69	s.	Sioux City, Iowa	25	56	nw.
Do	13	72	s.	Do	26	56	nw.
Do	14	70	s.	Williston, N. Dak	25	60	n.
Do	15	60	s.	Winnemucca, Nev	31	72	sw.
Do	17	54	se.	Woods Hole, Mass	15	52	sw.
Do	19	63	se.	Do	25	51	s.
Do	20	50	s.				

SUNSHINE AND CLOUDINESS.

There was very little sunshine and, conversely, very great cloudiness on the north Pacific coast, the northern Plateau, and the upper portion of the middle Plateau. The very great cloudiness in the Plateau region is rather remarkable, considering the high pressure that prevailed there.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.8	−0.5	Missouri Valley	4.8	−0.3
Middle Atlantic	5.5	−0.1	Northern Slope	5.7	+1.1
South Atlantic	6.0	+0.7	Middle Slope	4.6	+0.8
Florida Peninsula	5.7	−1.0	Southern Slope	4.0	+0.2
East Gulf	6.3	+0.7	Southern Plateau	2.2	−0.7
West Gulf	5.6	+0.2	Middle Plateau	6.4	−1.6
Ohio Valley and Tennessee	6.4	0.0	Northern Plateau	8.2	+0.9
Lower Lake	7.1	−0.4	North Pacific Coast	8.7	+1.6
Upper Lake	6.2	−0.6	Middle Pacific Coast	6.3	+1.2
North Dakota	4.9	+0.2	South Pacific Coast	4.0	−0.1
Upper Mississippi Valley	5.2	−0.1			

HUMIDITY.

The relative humidity of the air continued relatively low in the middle and south Pacific coast districts as well as throughout the Plateau region, although precipitation and cloudiness were both above normal in the first named.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	74	− 2	Missouri Valley	70	− 8
Middle Atlantic	75	0	Northern Slope	67	− 3
South Atlantic	80	+ 2	Middle Slope	67	0
Florida Peninsula	84	+ 2	Southern Slope	66	+ 2
East Gulf	78	0	Southern Plateau	47	− 4
West Gulf	76	+ 1	Middle Plateau	68	− 1
Ohio Valley and Tennessee	77	0	Northern Plateau	79	− 2
Lower Lake	75	− 6	North Pacific Coast	89	+ 2
Upper Lake	84	+ 2	Middle Pacific Coast	76	5
North Dakota	75	− 6	South Pacific Coast	68	− 6
Upper Mississippi Valley	76	− 2			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Four hundred and twenty-six reports of thunderstorms were received during the current month as against 887 in 1898 and 148 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 24th, 122; 13th, 60; 14th, 50; 4th, 39. The periods of greatest frequency were: 4–6th, 12–14th, 23d–25th.

Reports were most numerous from: Ohio, 46; Arkansas, 44; New Jersey, 35; Texas, 28; Mississippi, 26; Kentucky and Maryland, 28.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be four, preceding and following the date of full moon, viz, from the 22d to the 30th.

The greatest number of reports were received for the following dates: 28th, 35; 29th, 6.

Reports were most numerous from: Minnesota and North Dakota, 12; Michigan, 9; Illinois and South Dakota, 6.

In Canada.—Auroras were reported as follows: Father Point, 11th; Quebec, 17th, 29th; Minnedosa, 16th, 17th, 18th, 20th, 24th, 29th; Prince Albert, 15th; Battleford, 24th.

No thunderstorms were reported.